DEVELCO
PRODUCTS

Prosumer Meter - SMMZB-310

Technical manual

Revised 31.05.2018

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RoHS CE

1 Cautionary notes

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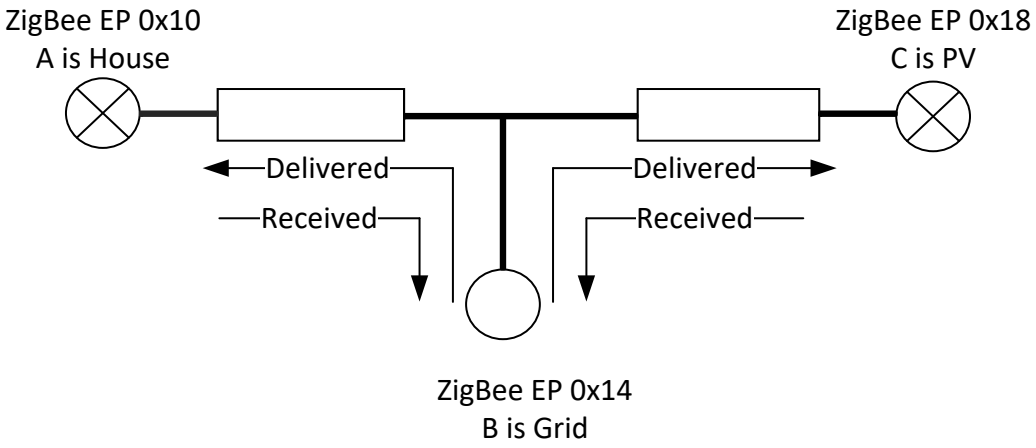
2 Features

2.1 Prosumer Meter – SMMZB-310

The Prosumer Meter serves as a ZigBee Smart Energy metering device. The meter has 2 physical meters and 3 logical ZigBee metering end points. Each meter can measure active energy in both directions.

The example below show how to measure the energy if a solar panel (PV) is connected to the house. For correct measurement it is important that grid is connected to terminal B.

Note: For correct wiring please read the installation manual.



Connection	ZigBee	Description
House L1, L2 and L3 in terminal A	End Point 0x10	Measure active energy in both directions
Grid L1, L2 and L3 in terminal B	End Point 0x14	Calculate active energy in both directions
PV L1, L2 and L3 in terminal C	End Point 0x18	Measure active energy in both directions

2.2 Key features

The ZigBee SE meter is acting as a router in the ZigBee Pro network.
Key features are:

- ZigBee SE 1.1.b certified device
- ZigBee HA 1.2 compliant device
- 2.4 GHz IEEE802.15.4
- Outdoor range LOS: up to 1600m

- Indoor range urban: up to 30m
- On board PCB antenna
- External antenna can be mounted
- Standard ZigBee OTA (Over The Air update)
- CE and ETSI compliant (pending)
- RoHS compliant according to the EU Directive 2002/95/EC
- Led and Switch MMI
- RJ11 connector sending DLMS-COSEM data
- Device is compiled as a ZigBee Router
- Freescale Kinetis MKW22D512V

3 ZigBee Endpoints

The device implements the following end points.

3.1 ZigBee Device Object (ZDO)

- End point number **0x00**
- Application profile **Id 0x0000**
- Application device **Id 0x0000**
- Supports all mandatory clusters

3.2 Develco Utility

- End point number **0x01**
- Application profile **Id 0xC0C9** (Develco Products private profile)
- Application device **Id 0x0001**
- Private profile for internal Develco Products use only.

3.3 ZigBee Smart Energy - Metering device

The device has 3 logical identically metering end points one for A, B and C as described in section 2.1

- End point number **0x10, 0x14** and **0x18**
- Application profile **Id 0x0109** (Smart Energy)
- Application device **Id 0x0501**

Supported mandatory clusters and the optional clusters are included in the list below.

Server side	**Client side**
Mandatory	
General – Basic	General - Key Establishment
General - Key Establishment	
Smart Energy - Metering	
Optional	
General – Identify	Smart Energy – Time
General – Alarms	
General - Electrical Measurement Cluster	General – OTA Upgrade

The device does not support the optional clusters in the list below.

- General - Power Configuration
- General - Inter-PAN Communication
- General - Commissioning

4 ZigBee Clusters

4.1 Basic Cluster

The Basic cluster has 2 attribute sets defined. In the following sections the attributes of these sets is listed. Refer to [Z2] for ZigBee specification of the basic cluster.
Only the first set has mandatory attributes, also the optional attributes that can be relevant to a device are all in set 0x000

4.1.1 0x000 Basic Device Information attribute set

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0	ZCLVersion	Uint8	Type range	M	
0x4	ManufacturerName	String	0-32 byte	O	
0x5	ModelIdentifier	String	0-32 byte	O	
0x6	DateCode	String	0-32 byte	O	
0x7	PowerSource	8 bit enum	Type range	M	
0x12	DeviceEanbled	Bool	Type range	O	

4.1.1.1 ManufacturerName

“Develco Products A/S

4.1.1.2 ModelIdentifier

SMMZB-310

4.2 Identify Cluster

The identify cluster serves as a way to make a device identify itself visually.
Refer to [Z2] for ZigBee specification of the identify cluster.
The Identify cluster only defines one attribute.

4.2.1 Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	IdentifyTime	Uint16	Type range	M	

4.2.2 Commands

The Identify cluster has 2 commands as server.

Id#	Name	Payload	Man/Opt	Relevance and ref.
0x00	Identify	Uint16 - Identify Time (seconds)	M	
0x01	Identify Query	none	M	

4.3 Key Establishment Cluster

The Key establishment cluster has 1 attribute set defined. In the following section the set is listed. Refer to [S1] for ZigBee specification of the Key Establishment cluster.

4.3.1 0x000 Information attribute set

Id#	Name	Type	Range	SE Req.	Relevance and ref.
0x00	KeyEstablishmentSuit	Uint16 bitmap	0x0000 – 0xFFFF	M	

Bit 0 - Certificate-based Key Establishment (CBKE-ECMQV)
Bit 1-15 reserved.

Note: the SE specification states that bit 0 must be set.

4.3.2 Commands

The Key Establishment cluster has 4 commands as server.

Id#	Name	Man/Opt	Relevance and ref.
0x00	Initiate Key Establishment Response	M	
0x01	Ephemeral Data Response	M	
0x02	Confirm Key Data Response	M	
0x03	Terminate Key Establishment	M	

The Key Establishment cluster has 4 commands as client.

Id#	Name	Man/Opt	Relevance and ref.
0x00	Initiate Key Establishment Response	M	
0x01	Ephemeral Data Response	M	
0x02	Confirm Key Data Response	M	
0x03	Terminate Key Establishment	M	

4.4 Time Cluster

The Time cluster is a general cluster for time it is based on a UTC time in seconds since 0 hrs 0 mins 0 sec on 1st January 2000. Refer to [Z2] for ZigBee specification of the time cluster.

The metering device will use this clusters as a client – provided that a suitable Time Server is available on the network (most likely on the Gateway/concentrator)

4.4.1 Attribute

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	Time	UTCTime (Uint32)	Type range	M	The module will periodically update its clock by synchronizing through this cluster
0x0001	TimeStatus	8 bit bitmap	00000xxx	M	

4.5 Metering Cluster

The device has 3 identically metering end points one for Grid, House and panel.

In the following sections the ZigBee SE metering cluster, is listed. Refer to [S1] for ZigBee specification of the Metering cluster.

4.5.1 0x00 Reading Information attribute set

Id#	Name	Type	Range	SE Req.	Relevance and ref.
0x00	CurrentSummationDelivered	Uint48	Type range	M	Recent summed value of Energy delivered.
0x01	CurrentSummationReceived	Uint48	Type range	O	Recent summed value of Energy generated.
0x02	CurrentMaxDemandDelivered	Uint48	Type range	O	The value is reset at midnight UTC time
0x03	CurrentMaxDemandReceived	Uint48	Type range	O	The value is reset at midnight UTC time
0x05	DailyFreezeTime	Uint16	Type Range	O	Read only
0x08	CurrentMaxDemandDeliveredTime	UTC Time	Type range	O	Represents the time when *CurrentMaxDemandDelivered* reading was captured

0x09	CurrentMaxDemandReceivedTime	UTC Time	Type range	O	Represents the time when *CurrentMaxDemandReceived* reading was captured
0x0F	ProfileIntervalPeriod	8-bit Enum	0x00-0xFF	O	Log is stored in a 5 min interval

Above attribute description is to be found in section D.3.2.2.1 "Reading Information Set" document "ZigBee Smart Energy Profile Specification" provided by the ZigBee alliance.

4.5.2 0x01 TOU Information attribute set

No attributes are support in this set.

4.5.3 0x02 Meter Status attribute set

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x00	Status	8 bit bitmap	Type range	M	0x0032 – Meter Status

Above attribute description is to be found in section D.3.2.2.3 "Meter Status Attribute" document "ZigBee Smart Energy Profile Specification" provided by the ZigBee alliance.

4.5.3.1 MeterStatus

The following table describe the meter status bits per metering type:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Service Disconnect Open	Leak Detect	Power Quality	Power Failure	Tamper Detect	Low Battery	Check Meter

4.5.4 0x03 Formatting attribute set

The following set of attributes provides the ratios and formatting hints required to transform the received summations, consumptions or demands/rates into displayable values. If the Multiplier and Divisor attribute values are non-zero, they are used in conjunction with the *SummationFormatting, ConsumptionFormatting*, and *DemandFormatting* attributes. Equations required to accomplish this task are defined below:

Summation = Summation received * Multiplier / Divisor
(formatted using *SummationFormatting)*

Consumption = Summation received * Multiplier / Divisor
(formatted using *ConsumptionFormatting)*

Demand = Demand received * Multiplier / Divisor
(formatted using *DemandFormatting)*

If the Multiplier and Divisor attribute values are zero, just the formatting hints defined in *SummationFormatting*, *ConsumptionFormatting*, and ***DemandFormatting*** attributes are used.

The following set of attributes provides the ratios and formatting hints required to transform the received summations, consumptions or demands/rates into displayable values. If the Multiplier and Divisor attribute values are non-zero, they are used in conjunction with the *SummationFormatting*, *ConsumptionFormatting*, and *DemandFormatting* attributes.

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x00	UnitofMeasure	8 bit enum	0x00 to 0xFF	M	Fixed to 0x00 (kW/kWh in pure binary format)
0x01	Multiplier	Uint24	0x000000 to 0xFFFFFF	O	Fixed to 1
0x02	Divisor	Uint24	0x000000 to 0xFFFFFF	O	Fixed to 1000
0x03	SummationFormatting	8 bit bitmap	0x00 to 0xFF	M	Fixed to 0xFB (3 digits to the right of the decimal point)
0x04	DemandFormatting	8 bit bitmap	0x00 to 0xFF	O	Fixed to 0xFB (3 digits to the right of the decimal point)
0x06	MeteringDeviceType	8 bit bitmap	0x00 to 0xFF	M	Fixed to 0x00 (Electric Meter)
0x08	MeterSerialNumber	Octet String	0-24 Octets	O	

Above attribute description is to be found in section D.3.2.2.4 “Formatting” ZigBee Smart Energy Profile Specification provided by the ZigBee alliance.

4.5.5 0x04 Historical attribute set

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x00	InstantaneousDemand	Int24	-8,388,607 to 8,388,607	O	

Above attribute description is to be found in section D.3.2.2.5 "Historical Consumption" document "ZigBee Smart Energy Profile Specification" provided by the ZigBee alliance.

4.5.6 Metering Cluster Commands

The metering cluster has the following command as server.

Id#	Name	Man/Opt	Relevance and ref.
0x00	Get Profile Response	M	D.3.2.2 ZigBee SE Specification

The meter is logging the following metering attributes for EP 0x10, 0x14 and 0x18 in an external flash every 5 min.

0x0000	CurrentSummationDelivered	Uint48	Recent summed value of Energy delivered.
0x0001	CurrentSummationReceived	Uint48	Recent summed value of Energy generated.

The Get profile command is used to retrieve the logs stored in the external flash.

4.6 Electrical Measurement Cluster

The 2 physical meters located on end point 0x10 and 0x18 support the electrical measurement cluster. This cluster provides a mechanism for querying data about the electrical properties as measured by the device

Id#	Name	Type	Man/Opt	Relevance and ref.
0x0000	MeasurementType	BitMap32	O	Section 4.6.1
0x0300	ACFrequency	Uint16	O	Non phase specific Measurement Reading in (Hz).
0x030D	MeasuredPhase1stHarmonicCurrent	Sint16	O	Phase1
0x0400	ACFrequencyMultiplier	Uint16	O	Fixed to 1
0x0401	ACFrequencyDivisor	Uint16	O	Fixed to 1000
0x0405	PhaseHarmonicCurrentMultiplier	Sint8	O	Fixed to -2
0x0505	RMSVoltage	Uint16	O	L1 - Volts (V)
0x0508	RMSCurrent	Uint16	O	L1 - Amps (A)
0x050B	ActivePower	Sint16	O	L1 - Watts (W).
0x050E	ReactivePower	Sint16	O	L1 - Watts (W).
0x0600	ACVoltageMultiplier	Uint16	O	Fixed to 1
0x0601	ACVoltageDivisor	Uint16	O	Fixed to 100
0x0602	ACCurrentMultiplier	Uint16	O	Fixed to 1
0x0603	ACCurrentDivisor	Uint16	O	Fixed to 1000
0x0604	ACPowerMultiplier	Uint16	O	Fixed to 1
0x0605	ACPowerDivisor	Uint16	O	Fixed to 1000
0x0905	RMSVoltagePhB	Uint16	O	L2 - Volts (V)
0x0908	RMSCurrentPhB	Uint16	O	L2 - Amps (A)
0x090B	ActivePowerPhB	Sint16	O	L2 - Watts (W).
0x090E	ReactivePowerPhB	Sint16	O	L2 - Watts (W).
0x0A05	RMSVoltagePhC	Uint16	O	L3 - Volts (V)
0x0A08	RMSCurrentPhC	Uint16	O	L3 - Amps (A)
0x0A0B	ActivePowerPhC	Sint16	O	L3 - Watts (W).
0x0A0E	ReactivePowerPhC	Sint16	O	L3 - Watts (W).

4.6.1 MeasurementType

Indicates a device's measurement capabilities

Bit	Flag name
0	Active measurement (AC)
1	Reactive measurement (AC)
2	Apparent measurement (AC)
3	Phase A measurement
4	Phase B measurement
5	Phase C measurement
6	DC measurement
7	Harmonics measurement
8	Power quality measurement

4.6.2 MeasuredPhase1stHarmonicCurrent

The *MeasuredPhase1stHarmonicCurrent* attributes represent the most recent phase of the 1st harmonic current reading in an AC frequency. The unit for this measurement is 10 ^ *Phase1sthHarmonicCurrentMultiplier* degree.

4.7 OTA Upgrade

The cluster provides a standard way to upgrade devices in the network via OTA messages. Thus the 3 upgrade process may be performed between two devices from different manufacturers. Devices are 4 required to have application bootloader and additional memory space in order to successfully 5 implement the cluster.

4.7.1 OTA Cluster Attributes

Id#	Name	Type	Range	Man/Opt	Relevance and ref.
0x0000	UpgradeServerID	IEEE Address	-	M	
0x0001	FileOffset	Uint32	Type range	O	
0x0002	CurrentFileVersion	Uint32	Type range	O	
0x0003	CurrentZigBeeStackVersion	Uint16	Type range	O	
0x0004	DownloadedFileVersion	Uint32	Type range	O	
0x0005	DownloadedZigBeeStackVersion	Uint16	Type range	M	
0x0006	ImageUpgradeStatus	8 bit enum	0x00 to 0xFF	O	

0x0007	Manufacturer ID	Uint16	Type range	O	
0x0008	Image Type ID	Uint16	Type range	O	
0x0009	MinimumBlockRequestDelay	Uint16	Type range	O	

Above attribute description is to be found in section 6.7 "OTA Cluster Attributes" in ZigBee document – "zigbee-ota-upgrade-cluster-specification" provided by the ZigBee alliance.

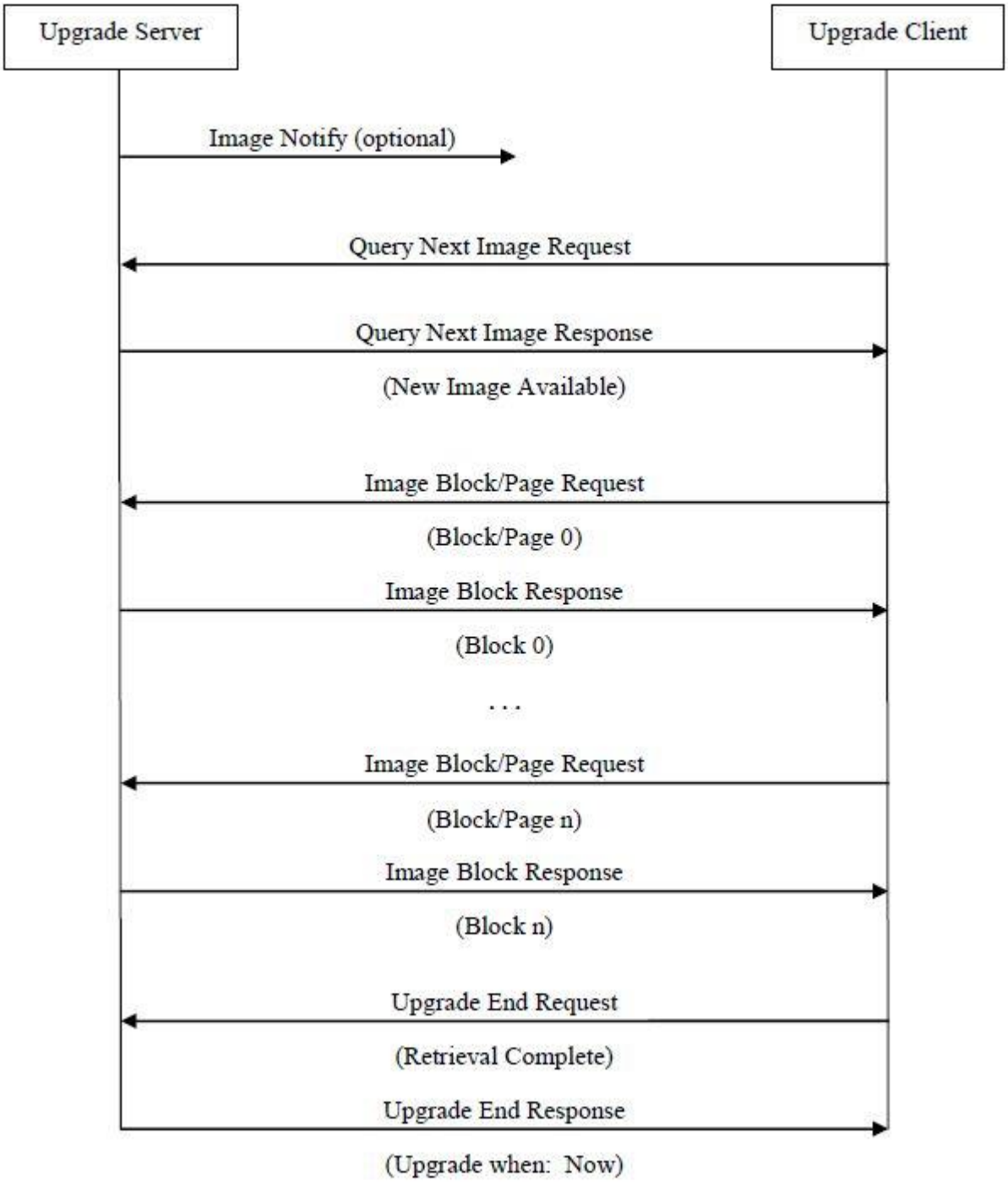
4.7.2 OTA Cluster Commands

The OTA Client cluster can send the following commands

Id#	Name	Man/Opt	Relevance and ref.
0x01	Query Next Image request	M	6.10.1 OTA Cluster Command Identifiers
0x03	Image Block Request	M	6.10.1 OTA Cluster Command Identifiers
0x06	Upgrade End Request	M	6.10.1 OTA Cluster Command Identifiers

4.7.3 OTA Upgrade Diagram

OTA Upgrade Message Diagram



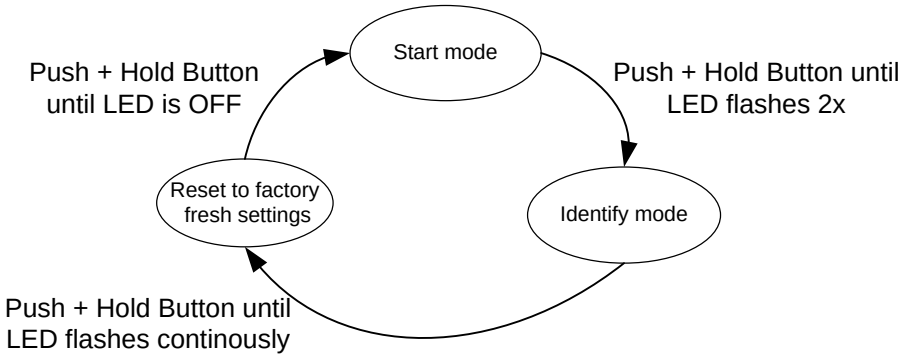
5 MMI user guide

Apply power to the metering device and use the switch mounted on the ZigBee module PCB.

The basic MMI functionality is implemented according the Develco MMI specification. The next section is an overview of this MMI specification.

5.1 Specific MMI

A button is pressed for a specific number of seconds in order to select the required mode.



1. Identify mode –The device begins to communicate with network in a period of 15 minutes. The LED is flashing each third second.
2. Reset to factory fresh settings – The device search for a new network. The LED is flashing each second.
3. Start mode – The device does nothing. The LED stops flashing.

5.2 PCB Switch

The PCB switch can without limitations be used to control the device in accordance with the Develco MMI specification described above.

5.3 LED signal strength indication

Signal strength	LED color
High	Green
Medium	Yellow/Orange
Low	Red
Bad	Led turned off

6 General network behaviour

6.1 Installation

The ZigBee meter can join any ZigBee SE 1.0 and 1.1 network.

To add a meter to the ZigBee network, the owner of the network shall use the installation code and send it "Out of Band" to the ESP device that contains the Trust Center.

According to the ZigBee Smart Energy Profile specification the Installation Code consists of a 64 bit number and a 16 bit CRC (using CCITT CRC standard polynomial X16 + X12 + X5 + 1).

The installation code can be found on a barcode label printed on the device.

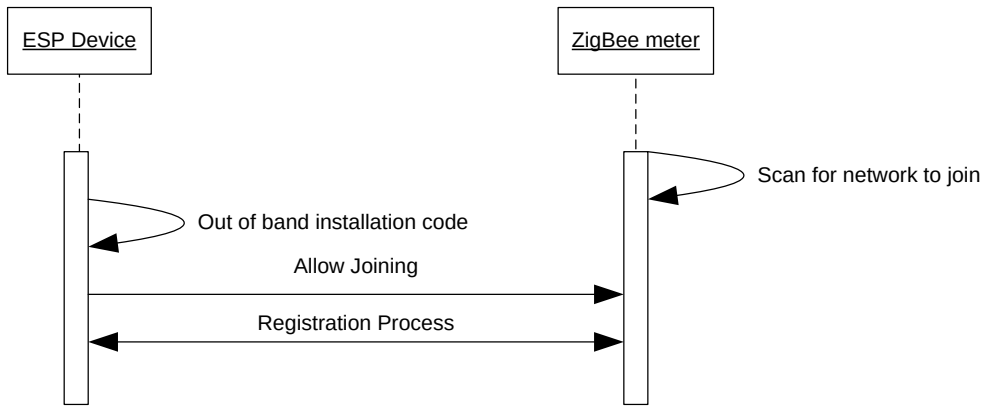
6.1.1 Installation flow

When the meter is virgin and powered for the first time it will start looking for at ZigBee PAN coordinator to join. Before the owner of the network can join the meter the installation code has to be sent to the Trust Center.

In section 4 "MMI" it is explained how to put the meter into a join or leave network mode.

Network settings are stored in NV-memory and after a power cycle the meter will re-join the same network.

If the device has to join a new PAN coordinator the MMI menu supports a "Join / Leave" mode.

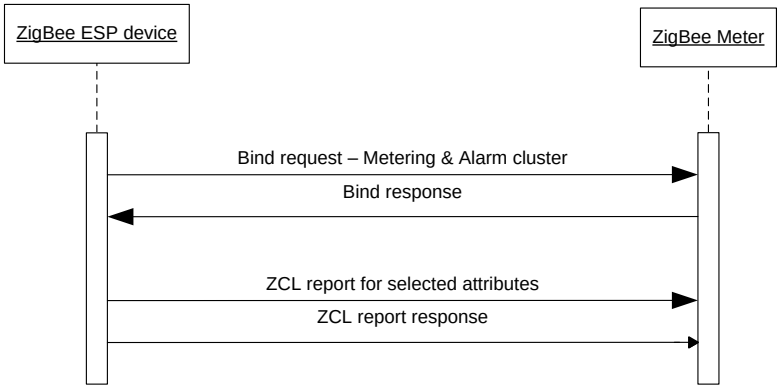


6.1.2 Configuration of attributes

After the meter has joined the ZigBee network the best practice for configuration is to:

1. Setup a binding between the meter and the device that shall receive the data. Typically a binding is configured for the Metering and Alarm cluster.

2. The ZigBee ZCL command call "Report Attributes Command" is used to configure the settings for the attributes behavior. Note that the last send report settings are valid for all the selected attributes on the current selected cluster. Each attribute cannot report in different time interval.

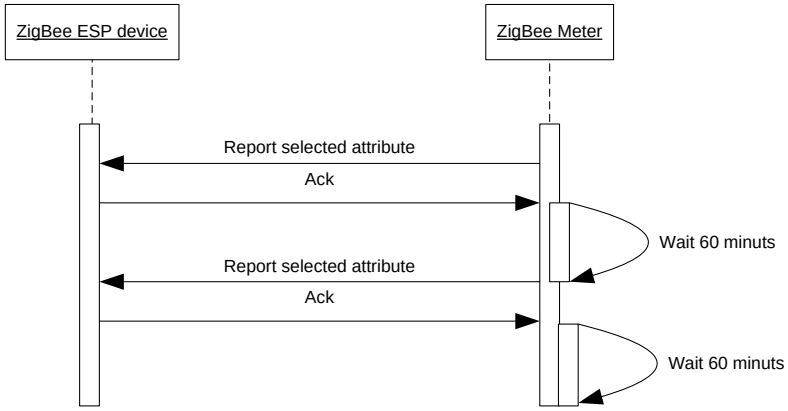


All configurations parameters are stored in NV-memory and after a power cycle the current selected attributes will start reporting again.

6.2 Normal

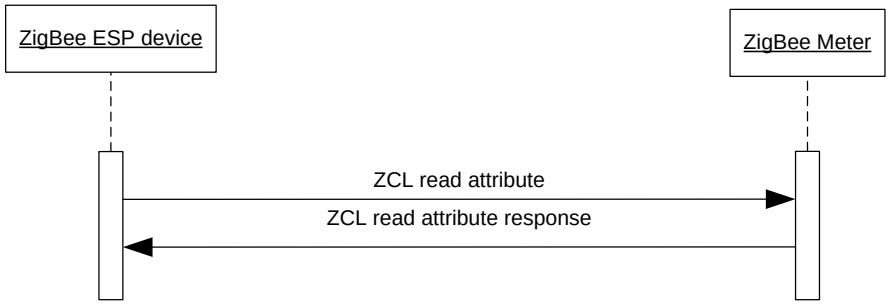
6.2.1 Reporting attributes

When the meter is configured to report attributes for example every 60 minutes the following communication flow will start.



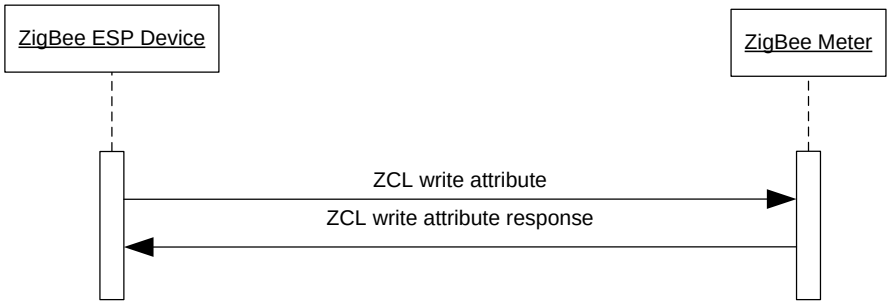
6.2.2 Read attributes

A ZigBee device can send a “Read attribute messages” and receive a response messages containing the current value of the selected attribute.



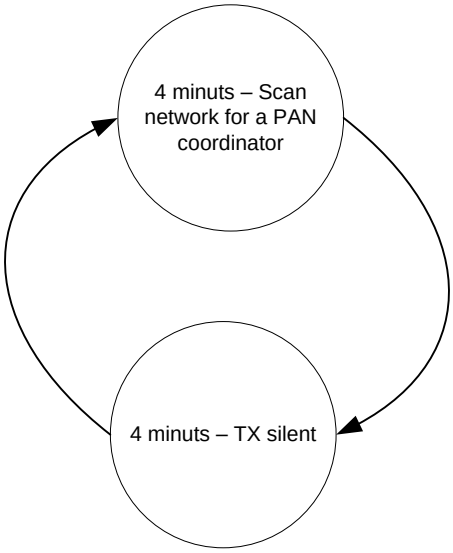
6.2.3 Write attributes

A ZigBee device can send a “Write attribute messages” and receive a status response messages.



6.2.4 Missing ACK

If the meter doesn’t receive an ACK from the ZigBee ESP device the meter will retransmit the messages 10 times. After 10 times without an ACK the meter has lost the connection to the network and the following sequence will start trying to re-establish a connection to the PAN coordinator again.

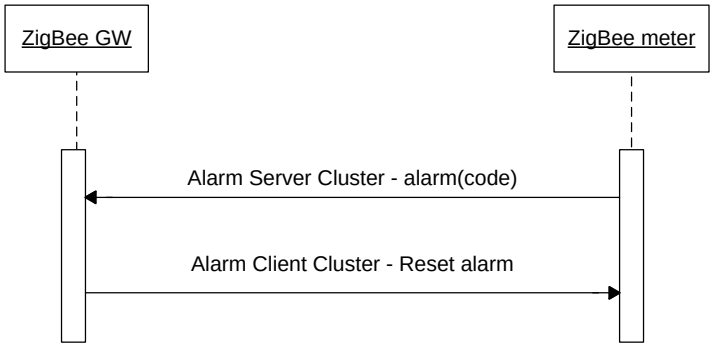


Note: The meter is not trying to connect to a new PAN coordinator. For joining a new PAN coordinator the meter has to be reset to factory default or the PAN Coordinator, containing the Trust Center, sends a leave network message.
The ZigBee module is configures to "RX On Idle". This setting means that any device in the ZigBee network can communicate with the meter directly and receive a response right away.

6.3 Alarm handling

The ZigBee meters has an alarm server cluster implemented as specified in the "ZigBee Cluster Library Specification" section 3.11 "Alarms Cluster" [Ref Z2].

The supported alarm code is described in this document section 3.7.3.1.

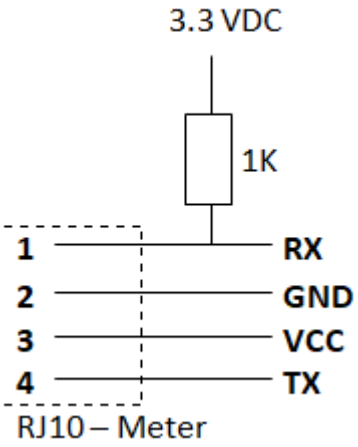


1. When the meter detects an alarm the alarm code is send to the Alarm client configured in the binding scenario.

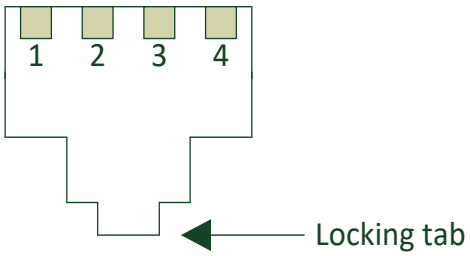
2. When the alarm cluster client detects an incoming alarm a “reset alarm” command is automatically generated within the client.
3. When the meter receives the “reset alarm” command. It stops sending the alarm code to the alarm client.

7 RJ10 – DLMS-COSEM object

The RJ10 connector has a serial interface and supports +3.3 based TTL UART signals. The interface is opto-isolated with a phototransistor. The user has to add a 3.3V to pin 3 and also add a 1 K pull up resistor to pin 1 for receiving data.



RJ10 connector in meter



RJ10 – PIN number	Function	Remark
1	RX	1K resistor pull up to 3.3 VCC
2	GND	
3	VCC	
4	TX	TTL level 3.3 VCC

UART that runs at [9600, 7, 1, EVEN]

The protocol is DLMS-COSEM mode A according to IEC 62056-21.

ObisCode+value pairs – all written in ascii:

Command send to meter

```
2018-02-22 15:17:17.149 [TX] - /?!<CR><LF>
```

Response from meter

```
2018-02-22 15:17:17.362 [RX] - /DEV*0015BC001900F342<CR><LF>
<STX>_0.9.40()<CR><LF>
1-1:16.7.0(0.000*W)<CR><LF>
1-1:1.8.0(0.352*kWh)<CR><LF>
1-1:2.8.0(3.286*kWh)<CR><LF>
1-1:31.7.0(0.000*A)<CR><LF>
1-1:51.7.0(0.000*A)<CR><LF>
1-1:71.7.0(0.000*A)<CR><LF>
1-2:16.7.0(0.000*W)<CR><LF>
1-2:1.8.0(0.403*kWh)<CR><LF>
1-2:2.8.0(0.210*kWh)<CR><LF>
1-2:31.7.0(0.000*A)<CR><LF>
1-2:51.7.0(0.000*A)<CR><LF>
1-2:71.7.0(0.000*A)<CR><LF>
1-3:16.7.0(0.000*W)<CR><LF>
1-3:1.8.0(3.148*kWh)<CR><LF>
1-3:2.8.0(0.021*kWh)<CR><LF>
1-3:31.7.0(0.000*A)<CR><LF>
1-3:51.7.0(0.000*A)<CR><LF>
1-3:71.7.0(0.000*A)<CR><LF>
1-0:32.7.0(221.92*V)<CR><LF>
1-0:52.7.0(221.92*V)<CR><LF>
1-0:72.7.0(221.92*V)<CR><LF>
!<CR><LF>
<ETX>_B
```

Same as above in HEX

Command send to meter

```
2018-02-22 15:17:17.149 [TX] - 2F 3F 21 0D 0A
```

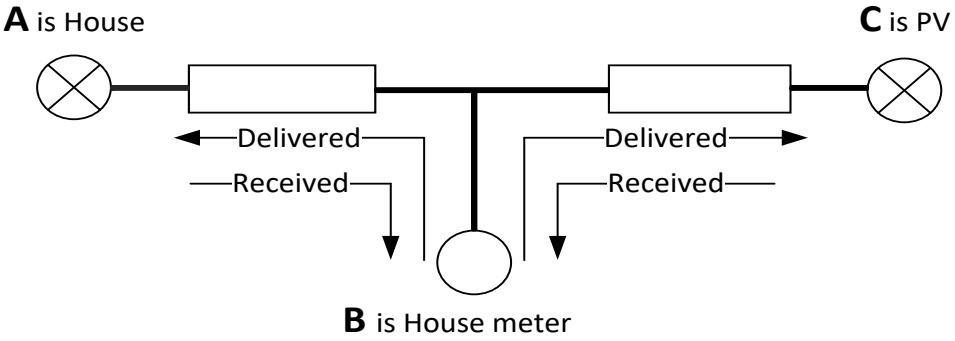
Response from meter

```
2018-02-22 15:17:17.362 [RX] - 2F 44 45 56 2A 30 30 31 35 42 43 30 30 31 39 30 30 46 33
34 32 0D 0A 02 30 2E 39 2E 34 30 28 29 0D 0A 31 2D 31 3A 31 36 2E 37 2E 30 28 30 2E 30
```

```
30 30 2A 57 29 0D 0A 31 2D 31 3A 31 2E 38 2E 30 28 30 2E 33 35 32 2A 6B 57 68 29 0D 0A
31 2D 31 3A 32 2E 38 2E 30 28 33 2E 32 38 36 2A 6B 57 68 29 0D 0A 31 2D 31 3A 33 31 2E
37 2E 30 28 30 2E 30 30 30 2A 41 29 0D 0A 31 2D 31 3A 35 31 2E 37 2E 30 28 30 2E 30 30
30 2A 41 29 0D 0A 31 2D 31 3A 37 31 2E 37 2E 30 28 30 2E 30 30 30 2A 41 29 0D 0A 31 2D
32 3A 31 36 2E 37 2E 30 28 30 2E 30 30 30 2A 57 29 0D 0A 31 2D 32 3A 31 2E 38 2E 30 28
30 2E 34 30 33 2A 6B 57 68 29 0D 0A 31 2D 32 3A 32 2E 38 2E 30 28 30 2E 32 31 30 2A 6B
57 68 29 0D 0A 31 2D 32 3A 33 31 2E 37 2E 30 28 30 2E 30 30 30 2A 41 29 0D 0A 31 2D 32
3A 35 31 2E 37 2E 30 28 30 2E 30 30 30 2A 41 29 0D 0A 31 2D 32 3A 37 31 2E 37 2E 30 28
30 2E 30 30 30 2A 41 29 0D 0A 31 2D 33 3A 31 36 2E 37 2E 30 28 30 2E 30 30 30 2A 57 29
0D 0A 31 2D 33 3A 31 2E 38 2E 30 28 33 2E 31 34 38 2A 6B 57 68 29 0D 0A 31 2D 33 3A 32
2E 38 2E 30 28 30 2E 30 32 31 2A 6B 57 68 29 0D 0A 31 2D 33 3A 33 31 2E 37 2E 30 28 30
2E 30 30 30 2A 41 29 0D 0A 31 2D 33 3A 35 31 2E 37 2E 30 28 30 2E 30 30 30 2A 41 29 0D
0A 31 2D 33 3A 37 31 2E 37 2E 30 28 30 2E 30 30 30 2A 41 29 0D 0A 31 2D 30 3A 33 32 2E
37 2E 30 28 32 32 31 2E 39 32 2A 56 29 0D 0A 31 2D 30 3A 35 32 2E 37 2E 30 28 32 32 31
2E 39 32 2A 56 29 0D 0A 31 2D 30 3A 37 32 2E 37 2E 30 28 32 32 31 2E 39 32 2A 56 29 0D
0A 21 0D 0A 03 42
```

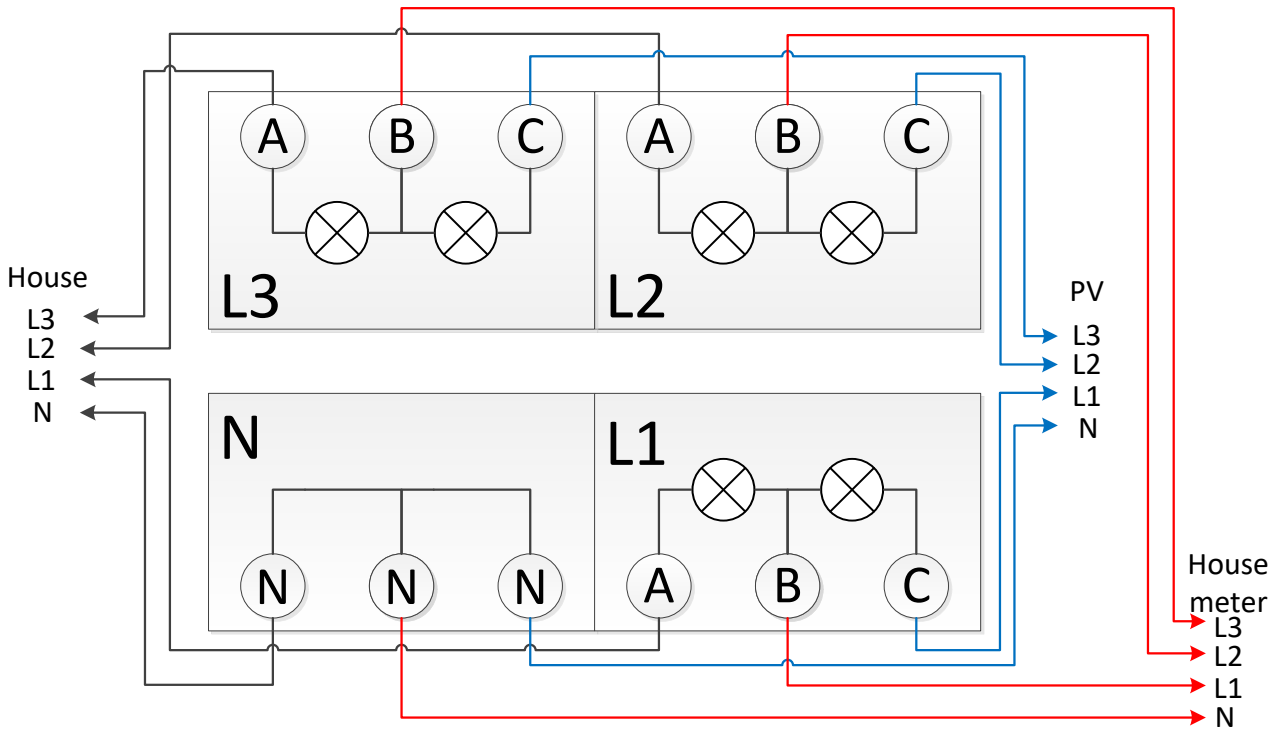
8 Wiring diagram

The meter is a sub-meter connected behind the current billing meter of the house.



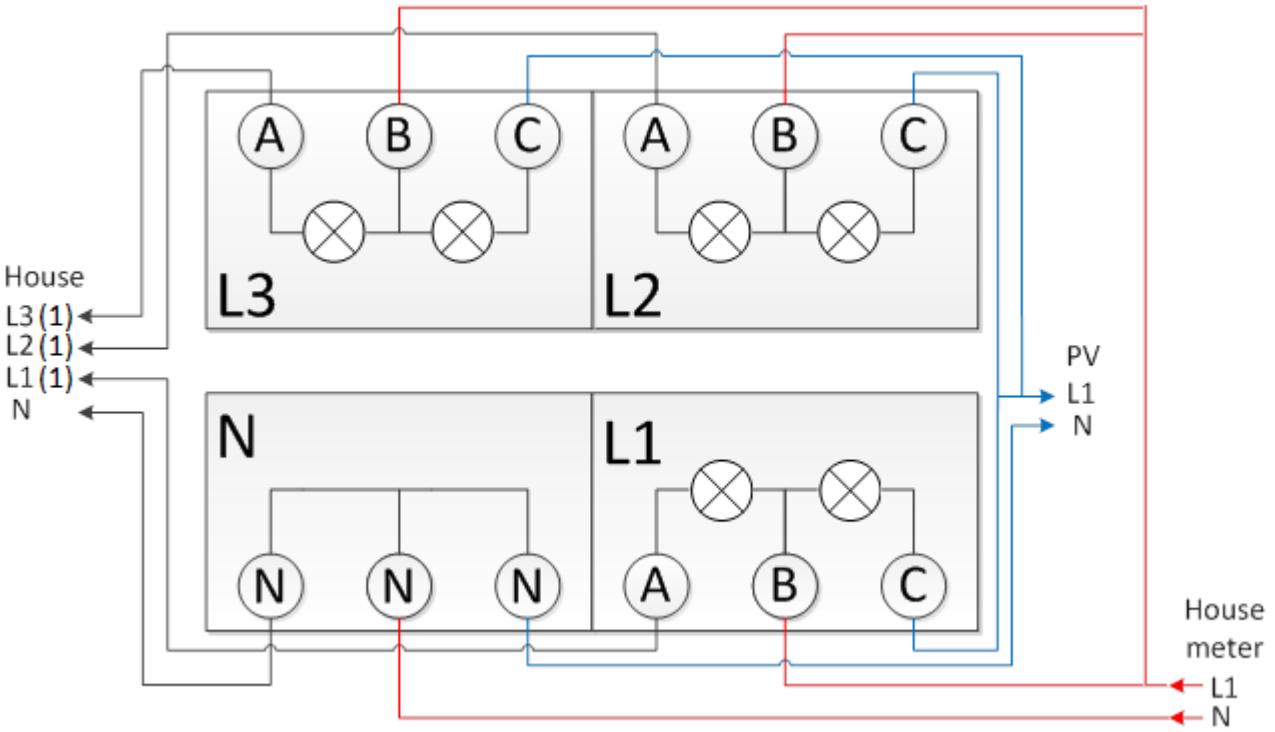
8.1 3-phase PV system

Wiring example of measuring a solar panel where house and PV are has the two physical meters.
3 phase 230V AC system with a 3-phase load/Production

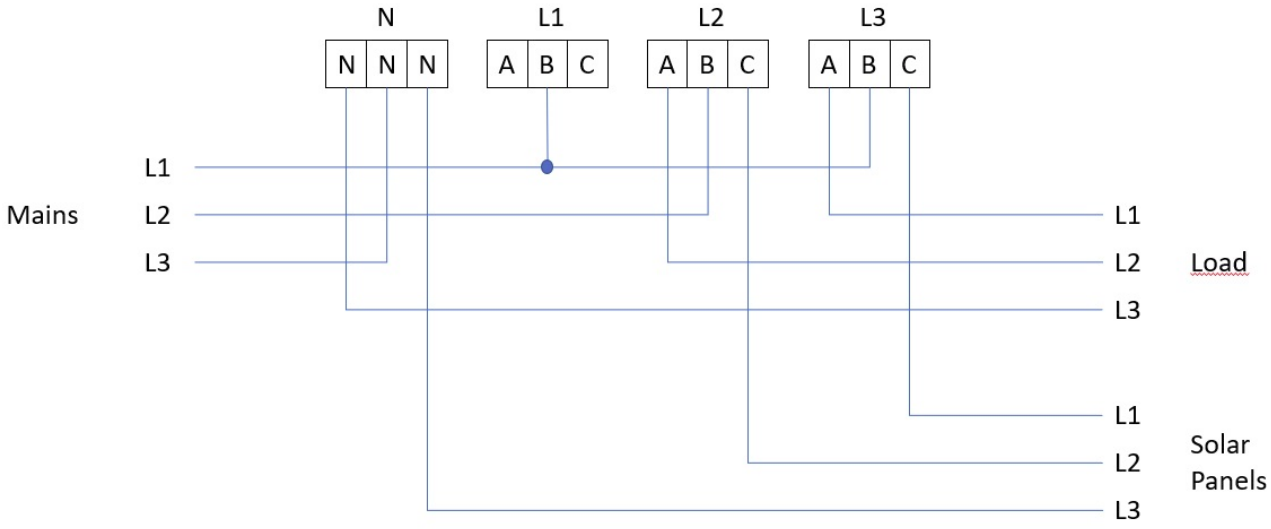


8.2 1-phase PV system

1 phase 230V AC system with a 1-phase load/Production



8.3 3-phase IT-net



There are some limitations in the prosumer meter hardware when it is wire as IT-net. It is NOT possible to get individual readings form all 3 phases. It is only possible to get reading from 2 phases.
It is still possible to get the total power from all 3 phases.

9 References

9.1 ZigBee standard documents:

[Z1] 053474r17ZB_TSC-ZigBee-Specification.pdf

[Z2] 075123r03ZB_AFG-ZigBee_Cluster_Library_Specification.pdf

[Z3] 064321r09ZB_TAG-ZigBee-Stack-Profile.doc

[Z4] 074855r05ZB_TAG-Pro-Stack-Profile.doc

[Z5] 053874r09ZB_AFG-Manufacturer-Code-Database.pdf

[Z6] 053298r14ZB_AFG-Framework-Profile-identifier-database.pdf

9.1.1 Smart Energy

[S1] 075356r15ZB_ZSE-ZSE-AMI_Profile_Specification.pdf

9.2 Develco documents:

[D1] Develco_Manufacturer_Specific_Cluster_Library_Specification.pdf

[D2] Private profile management.pdf

10 Contact Information

Technical support: Please contact Develco Products for support.
products@develcoproducts.com

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info@develcoproducts.com